

Running head: ADD/ADHD: EFFECTS ON MATHEMATICS

ADD/ADHD: Effects on Mathematics and Mathematical Computations

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Abstract

This study evaluates research that provides an understanding about mathematical results which can be determined independently from contributing factors. The relevance of the findings is important because there are many different reasons hypothesized by researchers as to why Attention Deficit Disorder/Attention Deficit Hyperactive Disorder (ADD/ADHD) students may be experiencing mathematical difficulties. If there are accommodations made for these mathematical/academic intervening issues, then, true mathematical difficulties can be addressed more specifically. Immediate intervention can be critical for students with ADD/ADHD because they are more likely to receive lower grades on standardized measures and academic subjects. Furthermore, particular learning difficulties vaguely substantiate reports that state half of the regular classroom children with ADD/ADHD will experience school failure or fail one grade by adolescence, and over one third will fail to finish high school. However, if an environment is created that is targeted at reducing ADD/ADHD students disruptive behaviors and a curriculum implemented that increases active engagement time on subjects for students then understanding and addressing their mathematical issues will become more accurate.

Chapter I: Introduction*Problem Statement*

The effects of Attention Deficit Disorder/Attention Deficit Hyperactive Disorder (ADD/ADHD) on students' academic performance is one that can greatly inhibit the cognitive process that needs to take place to build a strong academic foundation. Research has been performed to look more specifically at the effects that ADD/ADHD has on mathematical performance, with mathematics being one of the more challenging courses of instruction that students face in their academic careers. There are environmental and pedagogical interventions that can be engaged to facilitate a process of teaching mathematics to children with ADD/ADHD, which is pivotal to their cognition, meta cognition and overall academic achievement.

Elements of the Problem

Educators need to understand that there are mathematical outcomes related to ADD/ADHD, which should be assessed independently of causative factors. This is extremely important because difficulties that students may be experiencing in mathematics may simply be contributed to non-mathematical implications. Some of these implications are as follows: reading requirements, lack of feedback, external pacing, visual motor skills, or problem length. Specific mathematical difficulties can be addressed if accommodations for these contributing factors can be made. Although research shows that students with ADD/ADHD have more selective difficulty learning sorting and categorical grouping than typical children, it is important that they are given this opportunity which will allow them more familiarization with information and concepts. There are several possible explanations why students with ADD/ADHD may have

more trouble with grouping and sorting than typical students. These explanations include the following:

1. Sorting time: The students may need an additional 5-10 minutes.
2. More repetition: The students may need more trials, more direct instruction or directed questioning on the salient features of the problem.
3. Simplicity: The teachers may need to reduce problem length and complexity, so learning may be more beneficial, especially for students with reading problems.

Purpose of Study

The purpose of this action research is to determine what methods educational practitioners find work more adequately when teaching ADD/ADHD students mathematical computation and concepts. This researcher will conduct surveys from people in the field of education, more specifically, those in academia who work with ADD/ADHD students.

Definition of Terms

The American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders

(2000) provides the following definitions:

Attention-Deficit/Hyperactivity Disorder: The essential feature of Attention-Deficit/Hyperactivity is a persistent pattern of inattention and / or hyperactivity-impulsivity that is more frequently displayed and more severe than is typically observed in individuals at a comparable level of development (p.85).

Diagnostic Criteria for Attention-Deficit/Hyperactivity Disorder

A. Either (1) or (2):

(1) six (or more) of the following symptoms of *inattention* have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

- (a) often fails to give close attention to details or makes careless mistakes in schoolwork, work or other activities
 - (b) often has difficulty sustaining attention in task or play activities
 - (c) often does not seem to listen when spoken to directly
 - (d) often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
 - (e) often has difficulty organizing task and activities
 - (f) often avoids, dislikes, or is reluctant to engage in task that require sustained mental effort (such as schoolwork or homework)
 - (g) often loses things necessary for task or activities (e.g., toys, school assignments, pencils, books or tools)
 - (h) is often easily distracted by extraneous stimuli
 - (i) is often forgetful in daily activities. (p. 91)
- (2) six (or more) of the following symptoms of *hyperactivity-impulsivity* have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

- (a) often fidgets with hands or feet or squirms in seat
- (b) often leaves seat in classroom or in other situations in which remaining seated is expected
- (c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
- (d) often has difficulty playing or engaging in leisure activities quietly

(e) is often “on the go” or often acts as if “driven by a motor”

(f) often talks excessively

Impulsivity

(g) often blurts out answers before questions have been completed

(h) often has difficulty awaiting turn

(i) often interrupts or intrudes on others (e.g. butts into conversations or games). (p. 92)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic or occupational functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or Personality Disorder). (pp. 92-93)

Research Question

Do students with ADD/ADHD learn better in classroom environments that are conducive to their ADD/ADHD needs while students receive instruction that helps the teacher identify pure mathematical-related issues?

Chapter II: Literature Review

Review of Literature

The literature of several researchers who have studied the issue of ADD/ADHD and mathematics will be reviewed in this chapter. It will guide educational practitioners in the most efficient ways as to deal with ADD/ADHD and mathematics; additionally, it will also provide a basis for parents who struggle with particular challenges at home with their children.

Zentall, Smith, Lee, and Wieczorek's (1994) study analyzed non-disabled elementary school boys and elementary school boys with Attention-Deficit Hyperactivity Disorder (ADHD), ages 7.4 through 14.5 years. The purpose was to conclude the effects of ADHD on conceptual and computational mathematics. The study extended the understanding of mathematics problem-solving by analyzing mathematics, task factors, and cognition independently.

The research was conducted to produce information evaluating the mathematical consequences of ADHD, involving the following constructs: Word-problem Assessment Program (WAP), Reading Assessment Program (RAP), Timed Arithmetic Task (TAT), and Behavioral Measures. The sample included 121 non-disabled elementary school boys and 107 elementary school boys with ADHD, 52 teachers (second through fifth grade from five suburban elementary schools) and 12 teams of teachers (sixth and seventh grades, in two suburban middle schools). The teachers were given descriptors of ADHD characteristics and asked to nominate up to 3 boys with attention problems and 3 average boys. Permission slips were sent home to 581 nominated students, with a response rate of 76%, which equated to 339 boys receiving parental permission. There were statistically significant mean differences between the boys with ADHD and the non-disabled comparisons in WAP, RAP, TAT, and Behavioral Measures.

Through examination of the word problem mean scores, Zentall et al. (1994) found that students with ADHD produced fewer correct answers. Also, children in higher grade levels produced more correct answers than did children in lower grade levels. Children with ADHD read the passages slower than their comparison counterparts without disabilities. The analysis for TAT yielded that children with ADHD calculated fewer computations accurately than the non-disabled, across different variations of computations and levels of difficulty. Younger children also yielded fewer correct answers than older children. Behaviorally, during computational tasks and reading tasks, children with ADHD moved in and out of their seats, looked away from their tasks, and talked more than their non-disabled comparison classmates.

There were statistically significant mean score differences between the boys with ADHD in WAP, RAP, TAT as well as behaviorally while testing. Zentall et al. (1994) found no significant differences between groups in ethnicity or learning disability status (i.e. LD vs. ADHD). However, speed was sensitive to group differences, across the age groups and type of operation, even when ADHD factors were taken into consideration. Overall, the study documents that there are mathematical outcomes of ADHD, which can be determined separately from attributing factors. The importance of this is that some of the problems that students may be encountering due to reading requirements, lack of feedback, poor visual motor skills, and problem length can be addressed if accommodations are made for their ADHD. This will, in turn, allow the teacher to address specific mathematics difficulties that the ADHD students may face.

Dupaul, Ervin Hook, and McGoey's (1998) empirical research involved Pennsylvanian elementary students, grades one through five. The authors' purpose of the study was to examine the effects of class-wide peer tutoring (CWPT) on children with Attention Deficit Hyperactive Disorder (ADHD). The researcher hypothesized that CWPT would generate higher levels of the

following: task engagement, lower physical activity, and better performance on weekly post tests, relative to typical classroom activities.

The data was generated through observation of the following constructs: classroom behavior, academic performance, and social validation. The sample included 19 ADHD students (16 boys and 3 girls) and 10 comparison students (these students did not serve as peer tutors for the students with ADHD during the CWPT conditions). The participating students' ages ranged from 6 -to10 years of age and were from urban and suburban school districts with the majority of the students' families belonging to the lower middle socioeconomic class. Fourteen children were Caucasian, 3 Hispanic and 2 African American. Students were observed in the dependent variable of classroom behavior in the following categories: active on task, passive on task, off task and fidgets. In assessing academic performance, students took pretests, Mondays prior to instruction, and posttests on Fridays after the lesson had been presented. The mathematics test included numerical problems to satisfy competency in performing arithmetic operations (i.e. addition, subtraction, multiplication, or division). CWPT conditions were administered 3 or 4 days per week on specific academic skills for 15-to 20 minutes, with the tutor and tutee going over a script of academic material and switching roles.

Dupaul's et al. (1998) found the effects of CWPT on students with ADHD in active task behavior produced a mean (M) of 29%. After the administration of CWPT, it rose to M= 83%. Passive task behavior, M= 43 %, after CWPT it declined to M=10%. High amounts of off-task behavior existed with M=27%, with a reduction to M=6% after CWPT. Fidgets were M= 6%, and after CWPT, it declined to M=2%. The research also demonstrated that changes in academic performance varied with ADHD students dependent on how challenging the presented academic

material was for each student, with the most success experienced when the material was more challenging on an individual basis.

Increased task-related attention, changes in classroom behavior, changes in academic performance, reduced disruptive off-task behavior, and increased active engagement time. All were a result of CWPT. The study demonstrated that significant increases in attention to academic materials can take place, even with students who have severe attention problems utilizing CWPT. There were also similar task-related behavior improvements in peer comparison observation students. Empirical evidence led Dupaul et al. (1998) to believe that it is not the disability that is critical, but more importantly, the arrangement of the educational environment. CWPT increased task-related attention and also engaged students in actively responding to academic material. With other treatments for ADHD, for example, stimulant medication, the latter was not produced. However, active engagement over time and implementing CWPD would produce sustained academic performance.

The purpose of Kercood, Zentall, and Lee's (2003) study was to determine the effects of actively categorizing mathematics problems and the problem solving performance of students with and without attention deficit disorder (ADD). The three major constructs were Free Sort (FS), Directed Sort (DS) and Non Sort (NS). FS was the activity in which the students were allowed to sort the problems based on characteristics or structures they identified. With DS, the students had to organize the mathematics problems based on pre-identified characteristics given by the examiner and under the examiner's guidance. NS was simply a matching-to sample task.

Kercood's et al. (2003) research would be considered formal quantitative research using analysis of variance through an F test as well as an ANCOVA to avert the skewness of mathematics computational ability. The ADD students (Group A) included 29 students: 27

Caucasian and 2 African American; 20 male and 9 female. The comparison group (Group C) was comprised of 23 students of whom 22 were Caucasian and 1 Hispanic American; 10 male and 13 female. These students were fifth and sixth graders selected from eight schools from three Midwestern school districts. The measures were as follows: accuracy, time and sorting categorical responses (this was measured using a Lackert model type survey administered to the students).

Due to all students in the NS condition matching the problems correctly, data from this condition did not fit in the accuracy analysis. The effects of an ANCOVA of all three conditions (FS, DS, NS) showed that students in the DS condition were more accurate than students in the FS in problem sorting; however, there was not any statistical significance (S.S.). Students in the FS condition took longer than DS students to finish the sorting task. There were no time differences in sorting between FS and DS students compared to those in the NS condition. Using the categorical sorting, the results indicated that the probability of scoring high-level responses, based on the concept of operation, was higher for those students in the DS than for the FS condition. As for problem solving accuracy, students under the FS condition outperformed students in the DS.

ADD students generally have difficulty with specific mathematical concepts and forming categories; thus, the Kercood's et al. (2003) study hypothesized that ADD students would benefit more from sorting/categorizing activities. This hypothesis was grounded in the belief that these types of activities would direct the attention of the students to important facets of the problems. The presumption that students with ADD may not attend to relevant stimuli and fail to build conceptual knowledge needed for some problems solving task was unfounded based on this research. Students with ADD failed to show predicted gains similar to the gains of their

comparison classmates, and this could be due to many possible reasons. Kercood's et al. (2003) believed a few possibilities could be the difficulties forming categories, needing more sorting time, or needing more directed instructions. Further research should be conducted taking some of the aforementioned into consideration.

Stein, Horenczyk, Blank, Dagan, Barak, Gumpel's (2002) research observed adolescents from a special education high school in Jerusalem, Israel, involving sleep disturbance in children with ADHD. This research was not directly related to mathematics specifically; however this researcher thought that it was very important to understanding some of the other difficulties that may affect ADD/ADHD students' performance in mathematics. Stein's et al. (2002) research attempted to ascertain the following three hypotheses: (1) adolescents diagnosed with ADHD in childhood would have more sleep disturbances than a control group; (2) sleep disturbance in these adolescents would correlate more with greater severity of depressive and anxiety symptoms; and (3) adolescents treated with methylphenidate (MPH) would demonstrate more sleep disturbances than non-medicated participants with ADHD.

Stein's et al. (2002) research design was developed to generate information pertaining to the following constructs: ADHD; sleep disturbances; depressive/anxiety symptoms of ADHD; and ADHD adolescents being medicated with (MPH). The sample included 32 non-medicated, 35 medicated and 77 in the control group. Psychiatrists, specializing in child and adolescent development, assessed all participants using criteria from the Diagnostic and Statistical Manual of Mental Disorders (2000), using a questionnaire. The children, teachers, and parents used the Conners Teacher Rating Scale (CTRS) and the Conners Parent Rating Scale (CPRS) to assess the severity of ADHD symptoms. The participants were also screened by two child and adolescent psychiatrists using criteria from Structured Clinical Interview for DSM-IV Axis I Disorders-

Patient Edition (1995). The criteria screened for the following symptoms: panic disorder; agoraphobia; social phobia; simple phobia; obsessive compulsive disorder; anorexia nervosa; bulimia nervosa; alcohol; drug/medication abuse; depressive disorder; bipolar disorder; and schizophrenic disorder.

A Mini Sleep Questionnaire (MSQ) was administered to students to evaluate the presence and severity of sleep disorders. According to Stein's et al. (2002) a total MSQ score of 24 or below indicates typical sleep, the ranges from 25-27, 28-30, and 30+ indicated mild, moderate or severe sleep problems, respectively.

Stein's et al. (2002), using a one-way ANOVA, followed by a pair-wise follow-up comparison, evaluated three groups and the differences among the mean scores on the total MSQ. A Chi-square analysis was also used to assess the difference in frequency in the multiple categories of sleep disturbances (no disturbance, mild, moderate, or severe disturbances). The researchers also used multiple regressions to analyze whether the symptoms of depression and anxiety would contribute to sleep disturbances among students with ADHD.

Stein's et al. (2002) compared both the non-medicated ($M=26.62$; $SD= 8.6$) and the control ($M=26.53$; $SD= 7.5$), to the medicated ($M=31.45$; $SD= 10.8$) students and found that the medicated had a tremendous elevation in their total MSQ score. The severity of depressive symptomatology was found to appreciably add to the extent of sleep disturbances (total MSQ) in participants with and without full blown ADHD, independent of principal ADHD symptoms and MPH treatment. The study did not find a greater disparity in sleep disturbances between diagnosed adolescents with ADD compared to the control group.

The study can help parents implement a strict adherence involving sleep times, especially with students with more severe ADHD symptoms and MPH treatments. This more structured

sleep schedule should have a positive effect on academic performance and help create more relaxed classroom behavior which will facilitate an environment more conducive to academic achievement in mathematics as well as in all subjects.

Chapter III: Methodology*Research Design*

A Lackert Survey will be used to help illustrate this action research and help the researcher understand what practitioners find to be the best method of teaching mathematics to children with ADD/ADHD. A Lackert scale is used to quantify attitudes, preferences, and individual reactions. Lackert scales and other attitudinal scales help induce the expressive and partisan responses practitioners have to the design of the research.

Sampling

This researcher will randomly select educational practitioners teaching mathematics in the metropolitan Detroit area who handle ADD/ADHD students. A total of 15 practitioners will be surveyed in the research.

Variables

In the literature review, researchers had numerous independent variables, some of which were peer tutoring, sorting time, increased repetitions, problem simplicity, sleep patterns, and reading comprehension. The dependent variables, mathematics and mathematical computations, were influenced by unrelated variables. Some of these variables were behavioral issues or mental disorders, for example, learning disabilities (LD) and depression as well as the medication, methylphenidate, could also contribute to disruptive behavior.

Method of Data Collection

Using a 5 point Lackert Scale (strongly agree-5, agree-4, disagree-3, strongly disagree-2, neither agree nor disagree-1) the data will be produced, with numerical values assigned to each category. The questions in the survey will be relative to what researchers found effective and ineffective for teaching mathematics to ADD/ADHD students.

Data Analysis Procedures

After the data has been generated, this researcher will assimilate the information into tables and graphs to display the differences and disparities in an academic and environmental approach when teaching mathematics to students with ADD/ADHD. In the survey educational practitioners will have 5 different selections options in the Lackert survey. The selections options range from: neither agree nor disagree, strongly disagree, disagree, agree, strongly agree. Lastly, the following information will summarize, conclude, and make recommendations based on practitioners' completion of the survey in appendix A: "ADD/ADHD Mathematical Survey".

Timeline

Beginning in September 2006 and ending in June 2007, at the close of the academic calendar year, the study will be conducted in a nine-month period. The survey will be administered twice, at the beginning of the school year and at the end of the school year to take into account any new findings that educators may have determined useful during the current school year.

Summary

Using current practitioners, this researcher will gather information about the most effective means to facilitate learning of mathematics in students with ADD/ADHD. Teachers and parents must learn what really prevents their ADD/ADHD children from learning mathematics effectively and then treat the mathematical deficiency. In some instances, the perceived mathematical deficiency may not be that at all. In reality it is the learning environment, the way the question is presented, the need for more repetitions, or lack of sleep due the medication that the ADD/ADHD student is receiving. Isolation of the actual problem is necessary to determine its cause. If the problem is ADD/ADHD-related or environmentally induced, education and medical practitioners, parents, and all concerned must help these students and not simply label and/or dismiss them.

Chapter IV: Research Findings

The following question was based on an ADD/ADHD mathematical survey. The surveys were completed by the following educational practitioners; general/special education teachers, mathematics department head, special education directors, principles and collegiate professors. This data was then converted into percentages and transferred to the tables and graphs below.

Data was collected from educational practitioners that taught various grade levels and academic areas. They were asked to fill out the survey's that asked questions about various differentiated instructional strategies to help improve the mathematical computation of students with ADD/ADHD.

Table 1 was utilized to illustrate how educational practitioners felt about reducing mathematical problems in length help ADD/ADHD students.

Response	Response %	Number
Neither Agree nor Disagree	0	0
Strongly Disagree	6.6	1
Disagree	26.6	4
Agree	40	6
Strongly Agree	26.6	4

The preceding are the results of the data collected regarding how educational practitioners felt about reducing mathematical problems in length help ADD/ADHD students. 0% of the practitioners surveyed responded neither agree nor disagree, 6.6 % of the practitioners responded strongly disagree, 26.6% of the practitioners responded disagree, 40% of the practitioners responded agree, and 26.6% of practitioners responded strongly agree.

The following question was based on an ADD/ADHD mathematical survey. The surveys were completed by the following educational practitioners; general/special education teachers, mathematics department head, special education directors, principles and collegiate professors. This data was then converted into percentages and transferred to the tables and graphs below.

Data was collected from educational practitioners that taught various grade levels and academic areas. They were asked to fill out the survey's that asked questions about various differentiated instructional strategies to help improve the mathematical computation of students with ADD/ADHD.

Table 2 was utilized to illustrate how educational practitioners felt about simplifying problems (i.e. wording or complexity) help ADD/ADHD students.

Response	Response %	Number
Neither Agree nor Disagree	0	0
Strongly Disagree	0	0
Disagree	6.6	1
Agree	53.3	8
Strongly Agree	40	6

The preceding are the results of the data collected regarding how educational practitioners felt about simplifying problems (i.e. wording or complexity) help ADD/ADHD students. 0% of the practitioners surveyed responded neither agree nor disagree, 0 % of the practitioners responded strongly disagree, 6.6% of the practitioners responded disagree, 53% of the practitioners responded agree, and 40% of practitioners responded strongly agree.

The following question was based on an ADD/ADHD mathematical survey. The surveys were completed by the following educational practitioners; general/special education teachers, mathematics department head, special education directors, principles and collegiate professors. This data was then converted into percentages and transferred to the tables and graphs below.

Data was collected from educational practitioners that taught various grade levels and academic areas. They were asked to fill out the survey's that asked questions about various differentiated instructional strategies to help improve the mathematical computation of students with ADD/ADHD.

Table 3 was utilized to illustrate how educational practitioners felt about increasing reading levels and ADD/ADHD student's mathematical computations.

Response	Response %	Number
Neither Agree nor Disagree	0	0
Strongly Disagree	26.6	4
Disagree	26.6	4
Agree	26.6	4
Strongly Agree	20	3

The preceding are the results of the data collected regarding how educational practitioners felt about increasing reading levels and ADD/ADHD student's mathematical computations. 0% of the practitioners surveyed responded neither agree nor disagree, 26.6 % of the practitioners responded strongly disagree, 26.6% of the practitioners responded disagree, 26.6% of the practitioners responded agree, and 20% of practitioners responded strongly agree.

The following question was based on an ADD/ADHD mathematical survey. The surveys were completed by the following educational practitioners; general/special education teachers, mathematics department head, special education directors, principles and collegiate professors. This data was then converted into percentages and transferred to the tables and graphs below.

Data was collected from educational practitioners that taught various grade levels and academic areas. They were asked to fill out the survey's that asked questions about various differentiated instructional strategies to help improve the mathematical computation of students with ADD/ADHD.

Table 4 was utilized to illustrate how educational practitioners felt about imposing order (i.e. sorting or grouping activities) involving ADD/ADHD students and mathematical concepts and computations.

Response	Response %	Number
Neither Agree nor Disagree	0	0
Strongly Disagree	0	0
Disagree	0	0
Agree	33.3	5
Strongly Agree	66.6	10

The preceding are the results of the data collected regarding how educational practitioners felt about imposing order involving ADD/ADHD students. 0% of the practitioners surveyed responded neither agree nor disagree, 0% of the practitioners responded strongly disagree, 0% of the practitioners responded disagree, 33.3% of the practitioners responded agree, and 66.6% of practitioners responded strongly agree.

The following question was based on an ADD/ADHD mathematical survey. The surveys were completed by the following educational practitioners; general/special education teachers, mathematics department head, special education directors, principles and collegiate professors. This data was then converted into percentages and transferred to the tables and graphs below.

Data was collected from educational practitioners that taught various grade levels and academic areas. They were asked to fill out the survey's that asked questions about various differentiated instructional strategies to help improve the mathematical computation of students with ADD/ADHD.

Table 5 was utilized to illustrate how educational practitioners felt about using peer tutoring to help ADD/ADHD students with mathematics.

Response	Response %	Number
Neither Agree nor Disagree	6.6	1
Strongly Disagree	6.6	1
Disagree	0	0
Agree	26.6	4
Strongly Agree	60	9

The preceding are the results of the data collected regarding how educational practitioners felt about using peer tutoring to help ADD/ADHD students with mathematics. 6.6% of the practitioners surveyed responded neither agree nor disagree, 6.6 % of the practitioners responded strongly disagree, 0% of the practitioners responded disagree, 26.6% of the practitioners responded agree, and 60% of practitioners responded strongly agree.

The following question was based on an ADD/ADHD mathematical survey. The surveys were completed by the following educational practitioners; general/special education teachers, mathematics department head, special education directors, principles and collegiate professors. This data was then converted into percentages and transferred to the tables and graphs below.

Data was collected from educational practitioners that taught various grade levels and academic areas. They were asked to fill out the survey's that asked questions about various differentiated instructional strategies to help improve the mathematical computation of students with ADD/ADHD.

Table 6 was utilized to illustrate how educational practitioners felt about ADD/ADHD students and their ability to group and categorize.

Response	Response %	Number
Neither Agree nor Disagree	0	0
Strongly Disagree	0	0
Disagree	13.3	2
Agree	33.3	5
Strongly Agree	53.3	8

The preceding are the results of the data collected regarding how educational practitioners felt about ADD/ADHD students and their ability to group and categorize. 0% of the practitioners surveyed responded neither agree nor disagree, 0 % of the practitioners responded strongly disagree, 13.3% of the practitioners responded disagree, 33.3% of the practitioners responded agree, and 53.3% of practitioners responded strongly agree.

The following question was based on an ADD/ADHD mathematical survey. The surveys were completed by the following educational practitioners; general/special education teachers, mathematics department head, special education directors, principles and collegiate professors. This data was then converted into percentages and transferred to the tables and graphs below.

Data was collected from educational practitioners that taught various grade levels and academic areas. They were asked to fill out the survey's that asked questions about various differentiated instructional strategies to help improve the mathematical computation of students with ADD/ADHD.

Table 7 was utilized to illustrate how educational practitioners felt about the problems with students that are on medication for their ADD/ADHD (i.e. Methylphenidate-MPH) versus those students that are not.

Response	Response %	Number
Neither Agree nor Disagree	6.6	1
Strongly Disagree	6.6	1
Disagree	6.6	1
Agree	20	3
Strongly Agree	60	9

The preceding are the results of the data collected regarding how educational practitioners felt about reducing the problems with students that are on medication for their ADD/ADHD. 6.6% of the practitioners surveyed responded neither agree nor disagree, 6.6 % of the practitioners responded strongly disagree, 6.6% of the practitioners responded disagree, 20% of the practitioners responded agree, and 60% of practitioners responded strongly agree.

The following question was based on an ADD/ADHD mathematical survey. The surveys were completed by the following educational practitioners; general/special education teachers, mathematics department head, special education directors, principles and collegiate professors. This data was then converted into percentages and transferred to the tables and graphs below.

Data was collected from educational practitioners that taught various grade levels and academic areas. They were asked to fill out the survey's that asked questions about various differentiated instructional strategies to help improve the mathematical computation of students with ADD/ADHD.

Table 8 was utilized to illustrate how educational practitioners felt about more repetitions of basic calculations and ADD/ADHD students (i.e. over learning of basic arithmetic).

Response	Response %	Number
Neither Agree nor Disagree	0	0
Strongly Disagree	0	0
Disagree	0	0
Agree	33.3	5
Strongly Agree	66.6	10

The preceding are the results of the data collected regarding how educational practitioners felt more repetitions of basic calculations and ADD/ADHD students. 0% of the practitioners surveyed responded neither agree nor disagree, 0 % of the practitioners responded strongly disagree, 0% of the practitioners responded disagree, 33.3% of the practitioners responded agree, and 66.6% of practitioners responded strongly agree.

The following question was based on an ADD/ADHD mathematical survey. The surveys were completed by the following educational practitioners; general/special education teachers, mathematics department head, special education directors, principles and collegiate professors. This data was then converted into percentages and transferred to the tables and graphs below.

Data was collected from educational practitioners that taught various grade levels and academic areas. They were asked to fill out the survey's that asked questions about various differentiated instructional strategies to help improve the mathematical computation of students with ADD/ADHD.

Table 9 was utilized to illustrate how educational practitioners felt about the use of more novel instruction (i.e. computer games, creative lesson planning, etc...) to benefit ADD/ADHD students.

Response	Response %	Number
Neither Agree nor Disagree	6.6	1
Strongly Disagree	13.3	2
Disagree	6.6	1
Agree	6.6	1
Strongly Agree	66.6	10

The preceding are the results of the data collected regarding how educational practitioners felt about the use of more novel instruction to benefit ADD/ADHD students. 6.6% of the practitioners surveyed responded neither agree nor disagree, 13.3 % of the practitioners responded strongly disagree, 6.6% of the practitioners responded disagree, 6.6% of the practitioners responded agree, and 66.6% of practitioners responded strongly agree.

The following question was based on an ADD/ADHD mathematical survey. The surveys were completed by the following educational practitioners; general/special education teachers, mathematics department head, special education directors, principles and collegiate professors. This data was then converted into percentages and transferred to the tables and graphs below.

Data was collected from educational practitioners that taught various grade levels and academic areas. They were asked to fill out the survey's that asked questions about various differentiated instructional strategies to help improve the mathematical computation of students with ADD/ADHD.

Table 10 was utilized to illustrate how educational practitioners felt about the environment in their classroom.

Response	Response %	Number
Neither Agree nor Disagree	0	0
Strongly Disagree	40	6
Disagree	46.6	7
Agree	13.3	2
Strongly Agree	0	0

The preceding are the results of the data collected regarding how educational practitioners felt about the environment in their classroom and ADD/ADHD students. 0% of the practitioners surveyed responded neither agree nor disagree, 40% of the practitioners responded strongly disagree, 46.6% of the practitioners responded disagree, 13.3% of the practitioners responded agree, and 0% of practitioners responded strongly agree.

Chapter V: Summary, Conclusions and Recommendations

The purpose of this research study is to determine what methods educational practitioners find work more adequately when teaching ADD/ADHD students mathematical computation and concepts. The following information will summarize, conclude, and make recommendations based on practitioners' completion of the survey in appendix A: "ADD/ADHD Mathematical Survey"

Summary

This research found that practitioners agree upon numerous educational processes when teaching mathematics to students with ADD/ADHD. However, the research also discovered that most educational practitioners, 86%, do not believe that their classroom environment is conducive to students with ADD/ADHD learning mathematics. This is a very important finding due to the simplicity of changing an environment to improve any student's academic performance, special education or general education students, regardless of the special needs labeling of the student in the education system. Changing or improving your classroom environment can be as simple as changing seats or allowing the use of mathematical tools (i.e. compass, ruler, calculator, time tables sheet, etc..) to using a smart board which allows students to see digital illustration of the perimeter of an irregular figure.

The following question was used to guide this study:

- Do students with ADD/ADHD learn better in classroom environments that are conducive to their ADD/ADHD needs while students receive instruction that helps the teacher identify pure mathematical-related issues?

Conclusion

1. Will reducing mathematical problems in length help ADD/ADHD students?
 - 32.2% Strongly Disagree or Disagree, while 86% Agree or Strongly Agree
2. Does simplifying problems (i.e. wording or complexity) help ADD/ADHD students?
 - 6.6% Strongly Disagree or Disagree, while 93.3% Agree or Strongly Agree
3. Does an increase in reading level help ADD/ADHD students with mathematical computations?
 - 53.2% Strongly Disagree or Disagree, while 46.6% Agree or Strongly Agree
4. Have you found that imposing order (i.e. sorting or grouping activities) can help ADD/ADHD students with mathematical concepts and computations?
 - 99% Agree or Strongly Agree
5. How does peer tutoring help ADD/ADHD students with mathematics?
 - 6.6% Neither agree nor Disagree, 6.6% Strongly Disagree or Disagree, while 86% Agree or Strongly Agree
6. Do you find that ADD/ADHD students have more trouble grouping and categorizing than normal students?
 - 13.3% Strongly Disagree or Disagree, while 86.6% Agree or Strongly Agree
7. Do you have just as many problems or more with students that are on medication for their ADD/ADHD (i.e. Methylphenidate-MPH) than with those students that are not?
 - 6.6% Neither agree nor Disagree, 6.6% Strongly Disagree or Disagree, while 86.6% Agree or Strongly Agree

8. Do you find that more repetitions of basic calculations help ADD/ADHD students (i.e. Over learning of basic arithmetic)?

- 0% Strongly Disagree or Disagree, while 99.9% Agree or Strongly Agree

9. Would the use of more novel instruction (i.e. computer games, creative lesson planning, etc...) benefit ADD/ADHD students more?

- 6.6% Neither agree nor Disagree, 19.9% Strongly Disagree or Disagree, while 73.2% Agree or Strongly Agree

10. Is the environment in your classroom conducive to students with ADD/ADHD learning mathematics?

- 86.6% Strongly Disagree or Disagree, while 13.3% Agree or Strongly Agree

Recommendations

There are a few recommendations that can be made based on this study. I believe that the most important recommendation is that educators need to make every effort to take any step towards making their classroom environment conducive to learning mathematics for children with ADD/ADHD. This step would not only help those students diagnosed with ADD/ADHD, it would also help those students that have not been diagnosed as well as the students in the general education population. Furthermore, this can be done so easily within the classroom, with the help of a counselor, special education teacher/director, or parents.

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Appendix A

ADD/ADHD Mathematical Survey

1. Will reducing mathematical problems in length help ADD/ADHD students?

1) Neither agree nor Disagree 2) Strongly Disagree 3) Disagree 4) Agree 5) Strongly Agree

2. Does simplifying problems (i.e. wording or complexity) help ADD/ADHD students?

1) Neither agree nor Disagree 2) Strongly Disagree 3) Disagree 4) Agree 5) Strongly Agree

3. Does an increase in reading level help ADD/ADHD students with mathematical computations?

1) Neither agree nor Disagree 2) Strongly Disagree 3) Disagree 4) Agree 5) Strongly Agree

4. Have you found that imposing order (i.e. sorting or grouping activities) can help ADD/ADHD students with mathematical concepts and computations?

1) Neither agree nor Disagree 2) Strongly Disagree 3) Disagree 4) Agree 5) Strongly Agree

5. How does peer tutoring help ADD/ADHD students with mathematics?

1) Neither agree nor Disagree 2) Strongly Disagree 3) Disagree 4) Agree 5) Strongly Agree

6. Do you find that ADD/ADHD students have more trouble grouping and categorizing than normal students?

1) Neither agree nor Disagree 2) Strongly Disagree 3) Disagree 4) Agree 5) Strongly Agree

7. Do you have just as many problems or more with students that are on medication for their ADD/ADHD (i.e. Methylphenidate-MPH) than with those students that are not?

1) Neither agree nor Disagree 2) Strongly Disagree 3) Disagree 4) Agree 5) Strongly Agree

8. Do you find that more repetitions of basic calculations help ADD/ADHD students (i.e. Over learning of basic arithmetic)?

1) Neither agree nor Disagree 2) Strongly Disagree 3) Disagree 4) Agree 5) Strongly Agree

9. Would the use of more novel instruction (i.e. computer games, creative lesson planning, etc...) benefit ADD/ADHD students more?

1) Neither agree nor Disagree 2) Strongly Disagree 3) Disagree 4) Agree 5) Strongly Agree

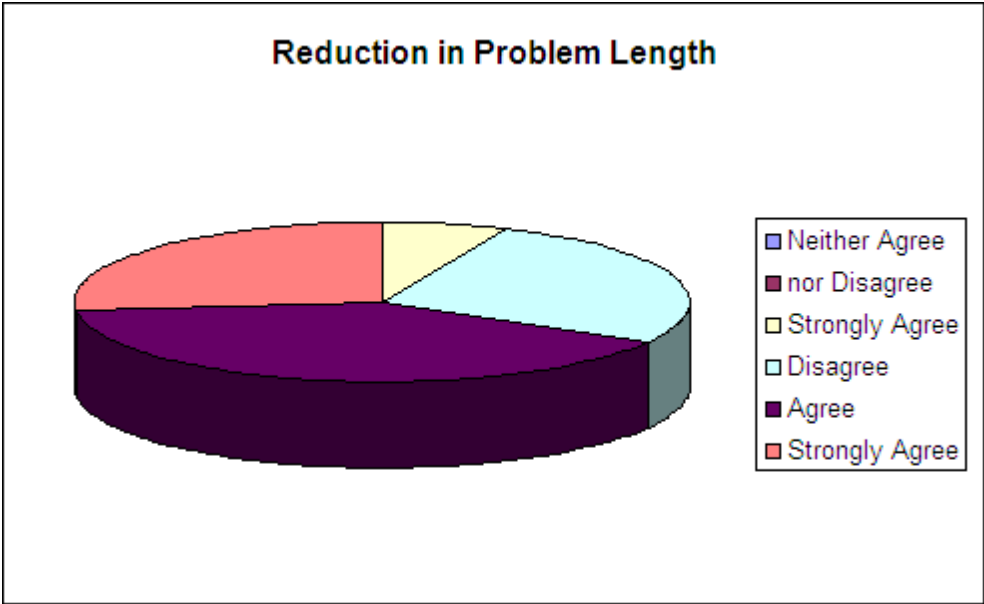
10. Is the environment in your classroom conducive to students with ADD/ADHD learning mathematics?

1) Neither agree nor Disagree 2) Strongly Disagree 3) Disagree 4) Agree 5) Strongly Agree

Appendix B

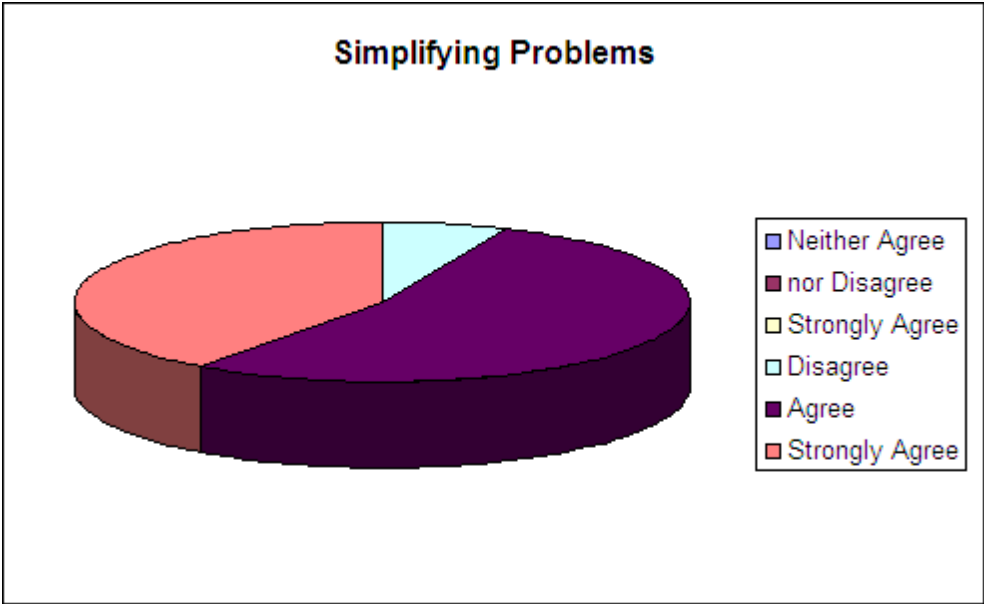
Neither Agree nor Disagree	0
Strongly Agree	6.6
Disagree	26.6
Agree	40
Strongly Agree	26.6

Question1



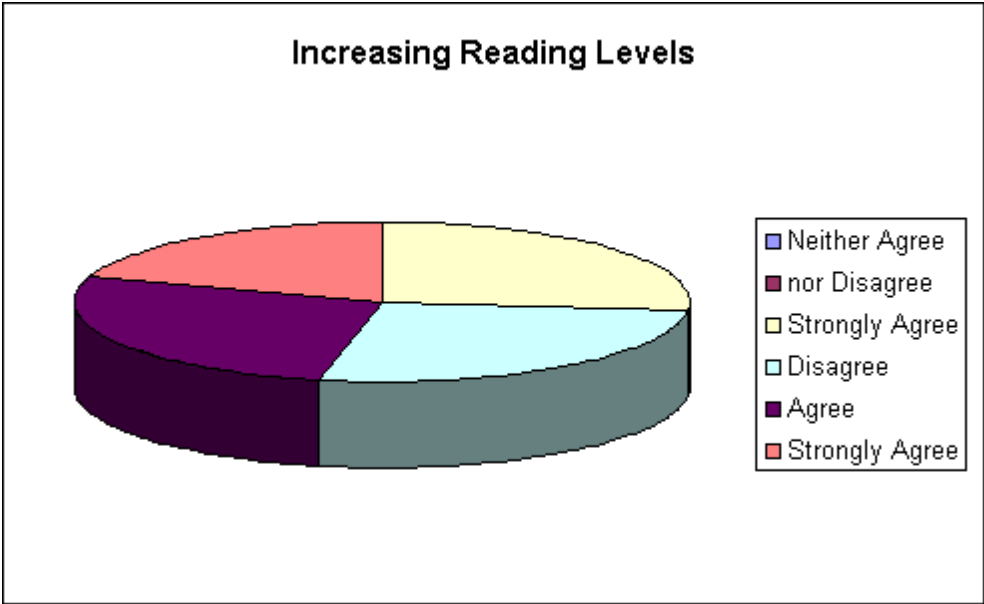
Neither Agree nor Disagree	0
Strongly Agree	0
Disagree	6.6
Agree	53.3
Strongly Agree	40

Question2



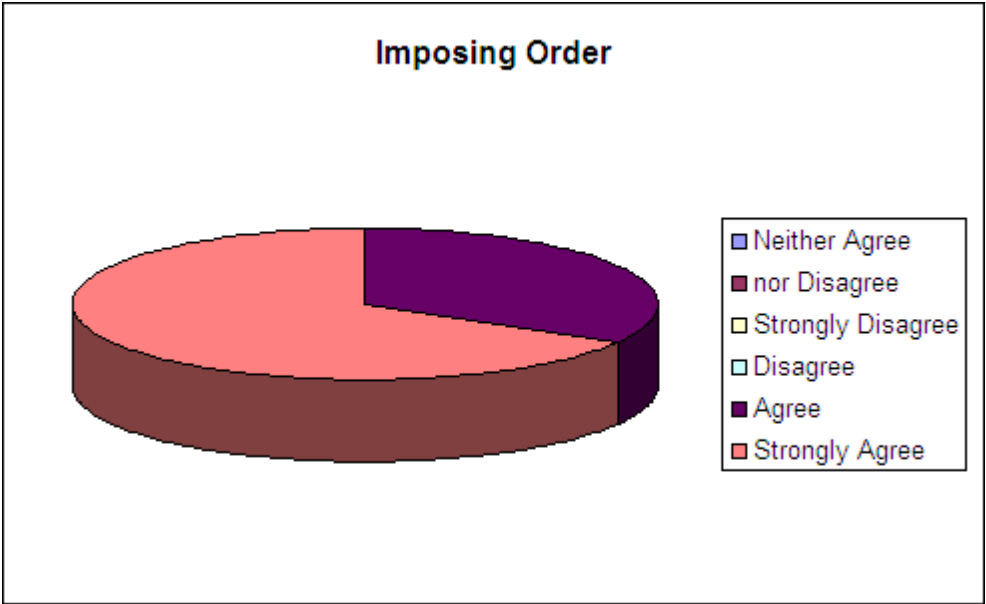
Neither Agree nor Disagree	0
Strongly Agree	26.6
Disagree	26.6
Agree	26.6
Strongly Agree	20

Question3



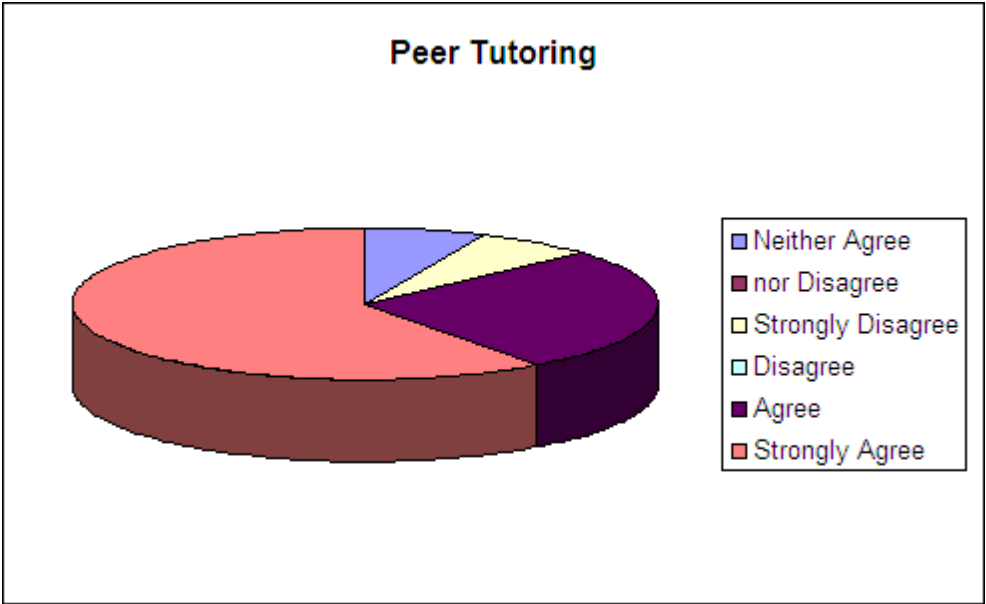
Neither Agree nor Disagree	0
Strongly Disagree	0
Disagree	0
Agree	33.3
Strongly Agree	66.6

Question4



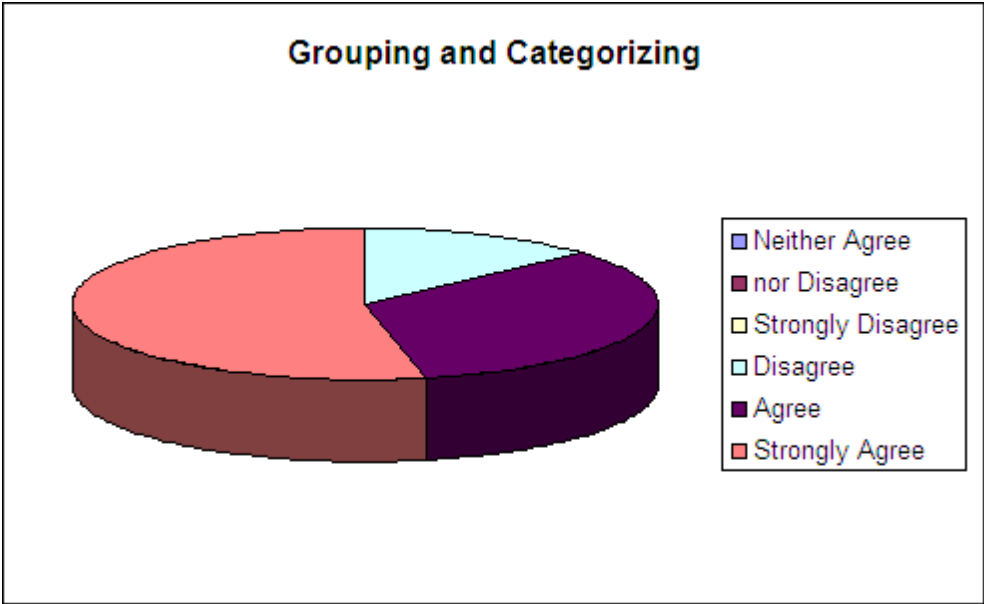
Neither Agree nor Disagree	6.6
Strongly Disagree	6.6
Disagree	0
Agree	26.6
Strongly Agree	60

Question5



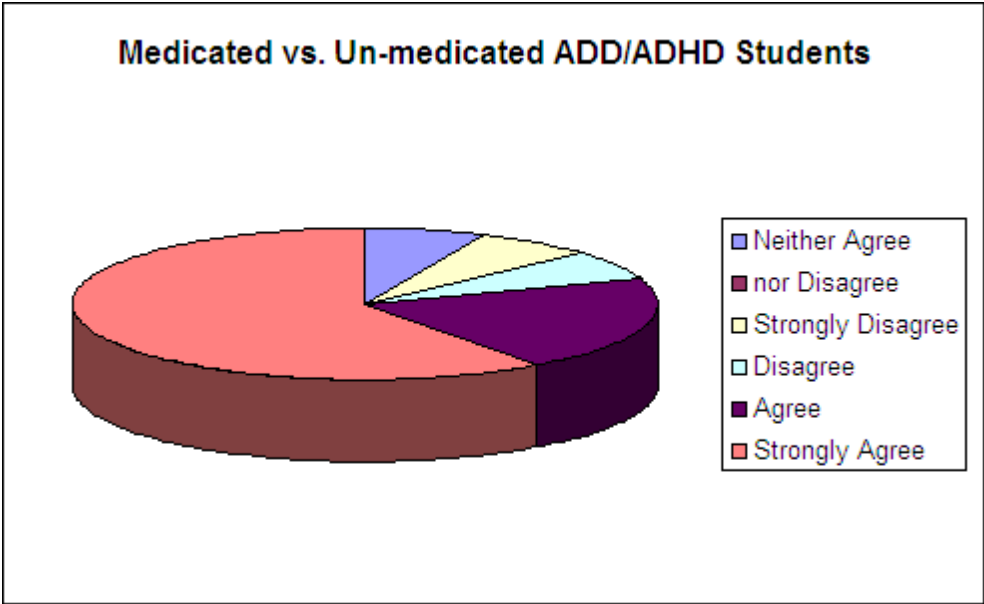
Neither Agree nor Disagree	0
Strongly Disagree	0
Disagree	13.3
Agree	33.3
Strongly Agree	53.3

Question6



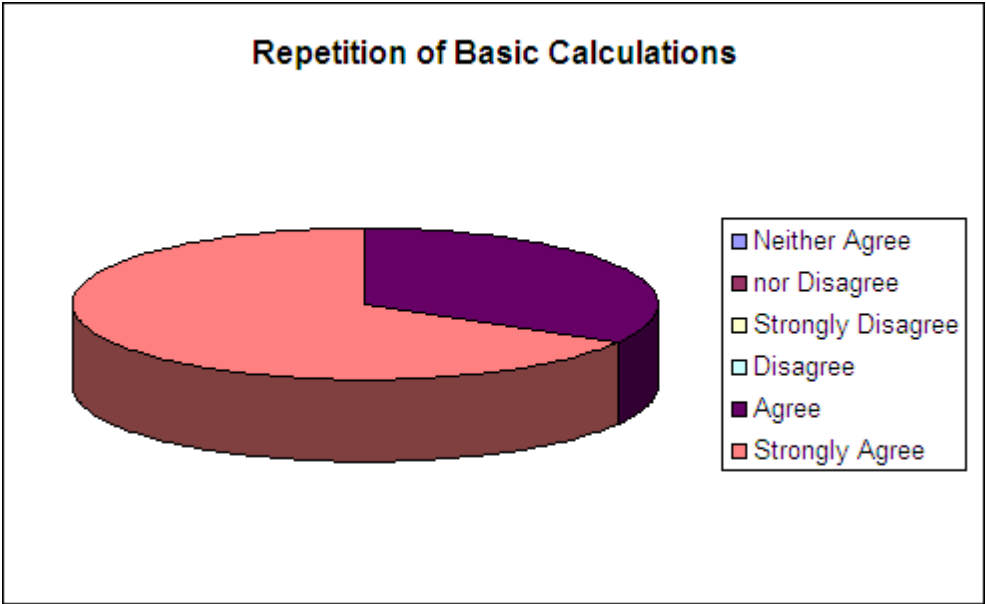
Neither Agree nor Disagree	6.6
Strongly Disagree	6.6
Disagree	6.6
Agree	20
Strongly Agree	60

Question7



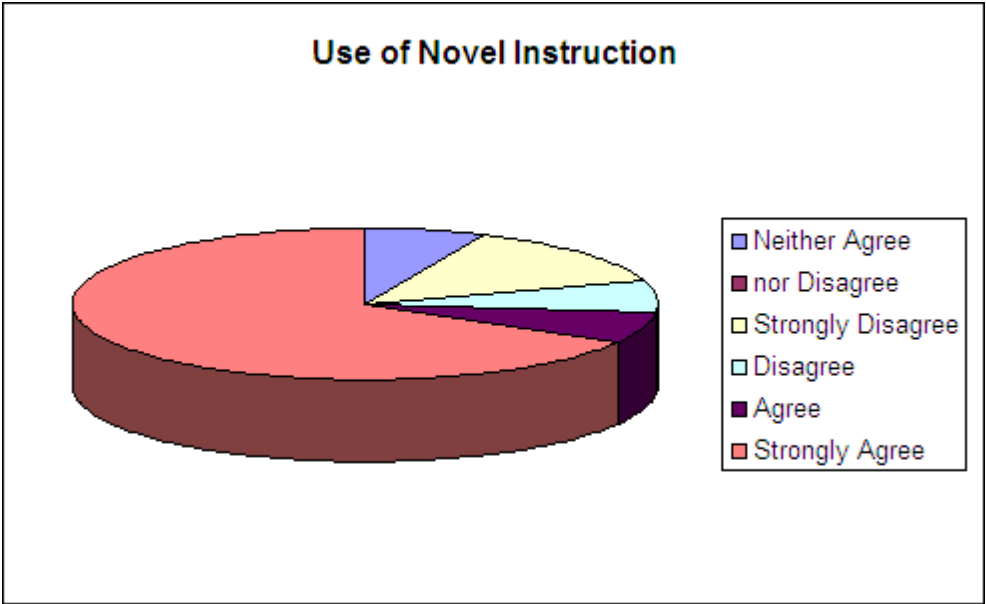
Neither Agree nor Disagree	0
Strongly Disagree	0
Disagree	0
Agree	33.3
Strongly Agree	66.6

Question8



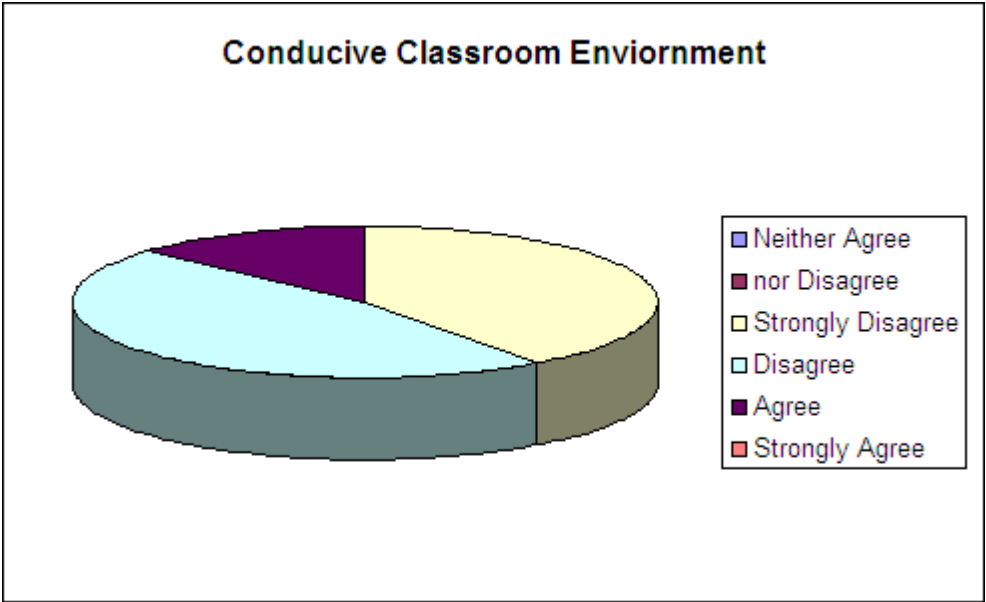
Neither Agree nor Disagree	6.6
Strongly Disagree	13.3
Disagree	6.6
Agree	6.6
Strongly Agree	66.6

Question9



Neither Agree nor Disagree	0
Strongly Disagree	40
Disagree	46.6
Agree	13.3
Strongly Agree	0

Question10



Appendix C

APPROVAL REQUEST FOR STUDIES INVOLVING HUMAN SUBJECTS

**MARYGROVE COLLEGE
Institutional Review Board**

Type all information which you provide. Approval **MUST** be renewed annually if you continue to gather data. This form is for NEW submissions only. **IMPORTANT NOTICE: YOU MUST INCLUDE** the instrument(s) [i.e., survey(s), questionnaire(s), schedule(s)], and consent form(s)]. **Submit two copies of the completed form, any consent documents, instruments, etc. Submit 3 copies of each form if your subjects are minors involving more than minimal risk, juveniles in detention centers or prisoners.** Omission of these items **will delay** the review process.

Project Title: ADD/ADHD: Effects on Mathematics and Mathematical Computation

Principal Investigator or Advisor

Name: Dr. Shaw

Department: Education

Office Address: Marygrove College 8425 W. McNichols, Detroit MI, 44221

Home Address: _____

Office Phone: (313) 927-1200

E-mail address: eshaw@marygrove.edu

Co-Principal or Student Investigator

Name: Michael D. Brooks

Department: Education (TASC)

Office Address: _____

Home Address: 16918 Cruse, Detroit MI, 48235

Home Phone: (313) 300-0777

E-mail address: mbrooks8279@marygrove.edu

Is this work for your Master's Thesis? Yes X No __

Proposed Start Date of Project: 9/6/06 **Proposed End Date of Project:** 6/16/07

Has Funding been requested? Yes ____ No X If yes, what is the source of funding? _____

This application is to be considered for (check only one box):

(X) Exempt Review* () Expedited Review* () Full Review

*cite specific criteria from IRB Guidelines (attached)

*Surveying educational practitioners provides no risk to the human subject participants.

Revised 9/06

Categories of Human Subjects to be studied:

Proposed Age Group of Subjects (range): 24-60 Proposed # of Subjects
30 _____

Participants in Special Consideration Categories:

_____ Children under age 18	_____ Non-English Speaking individuals
_____ Cognitively-impaired persons	_____ Students
_____ Prisoners	_____ Wards
_____ Pregnant women	_____ Economically or Educationally
_____ Disadvantaged persons	
_____ Other subjects whose life circumstances may interfere with their ability to make free choice in consenting to take part in research (please specify)	

If any of these populations will be included in your study, on a separate sheet of paper, explain the rationale for including these vulnerable populations and ways in which they will be protected.

PROJECT OUTLINE

In order to review applications in an adequate and timely way, the Committee wishes to see the highlights of your study. We encourage you to use bullet formatting whenever possible, but to provide complete and accurate information. **Please do not attach your thesis proposal, grant application, etc. These cannot be processed by IRB and will be returned to you.**

Note: IRB review focuses on the scientific merit and adequacy of experimental design as well as on issues of safety and protection of confidentiality

1. Project Description: State briefly but precisely the following: the purpose of the research, the research procedure (including what exactly participants will do as part of the study), method of data collection, and how the results will be disseminated (e.g., thesis, peer-reviewed journal, presentation). Attach questionnaires, interview scripts, etc. Coding sheets for video- or audio-tapes and other data collection procedures are required.

- The purpose of this action research is to determine what methods educational practitioners find works more adequately when teaching ADD/ADHD students mathematical concepts and computations.
- A Lackert Survey will be used to help illustrate, through this action research, the best method of teaching mathematics to children with ADD/ADHD.
- Using a 5 point Lackert Model, the data will be produced with numerical percentages assigned to each category.
- I will disseminate the results in my thesis.

Revised 9/06

2. Benefits of Research: Briefly describe the expected or known benefits of the research. Indicate benefits specific to the research participant in addition to longer term or more general benefits.

The expected benefit of the research will be to create a well grounded, more knowledgeable resource on how to effectively instruct students diagnosed with ADD/ADHD in mathematics.

3. Subjects: Describe how you intend to contact and recruit participants. Attach all written advertisements, posters and oral recruitment scripts. The exclusion of women and minorities in research studies must be specifically justified. If certain populations are intentionally excluded in your study, this needs to be well documented.

I will primarily survey my colleagues, family and friends that are in education or administration and have extensive teaching experience as well as experience with students that have been labeled or diagnosed with ADD/ADHD.

4. **Safety:** State in adequate detail any anticipated physical, mental, emotional or social risk to the subjects of this research activity and the degree of likelihood that it may occur. Explain the procedure in detail and the rationale for using it. Describe measures to be taken to protect subjects from possible risks or discomfort. (Risks include even mild discomforts or inconveniences, as well as potential for disclosure of sensitive information.)

None

If the study involves deception, when and how will the subjects be debriefed? (Generally, the nature of the deception and its necessity should be explained to the subjects).

Revised 9/06

5. **Confidentiality:** Describe in adequate detail what measures will be taken to protect the confidentiality of the data to be obtained and the subjects' right to privacy. Be explicit if data are sensitive. Describe coding procedures for subject identification. Include the method, location and duration of data retention. (Federal regulations require data to be maintained for at least 3 years. Your professional society may require you to keep it longer). If video- or audio tapes will be used, indicate how confidentiality of the material produced by such devices will be protected, and what will become of the recordings after the data has been collected.

I will place questioners in the mailboxes of the people I work with and personally deliver to others and have other surveys delivered. However, I will not ask the practitioners to provide any additional information as they anonymously place them in my mailbox or designated drop off area.

6. **Informed Consent:** Describe the process by which informed consent will be obtained. If the participant is a child or mentally challenged, explain how the parent(s)/guardian(s) will be contacted for consent and how the researcher will ensure that the participant understands and assents to the research. Prepare and submit an appropriate consent form utilizing the attached Policy Concerning Informed Consent document. If using oral consent, please provide a copy (script) of the text you will use.

"Will you mind if I use the answers from this anonymous Lackert survey to complete my master thesis?"

**Federal regulations require that we have current consent form(s) being used on file.
Omission of consent form(s) will delay the review process.**

Revised 9/06

This page is to be signed by the principal investigator. If the PI is an undergraduate or graduate student, the faculty supervisor must also sign.

<div style="border-bottom: 1px solid black; margin-bottom: 10px;"></div> <div style="display: flex; justify-content: space-between;"> Signature of Principal Investigator Date </div>

NOTE: A research proposal by a graduate or undergraduate student **must** have the following statement signed by a faculty supervisor.

"I have examined this completed form and I am satisfied with the adequacy of the proposed research design and the measures proposed for the protection of human subjects. I will take responsibility for informing the student of the need for the safekeeping of all raw data (e.g., test protocols, tapes, questionnaires, interview notes, etc.) in a College office or computer file."

<div style="border-bottom: 1px solid black; margin-bottom: 10px;"></div> <div style="border-bottom: 1px solid black; margin-bottom: 10px;"></div> <div>Print Name and Title of Faculty Supervisor</div>	<div style="border-bottom: 1px solid black; margin-bottom: 10px;"></div> <div>Signature of Faculty Supervisor</div>
<div style="border-bottom: 1px solid black; margin-bottom: 10px;"></div> <div>Office Phone</div>	<div style="border-bottom: 1px solid black; margin-bottom: 10px;"></div> <div>Date</div>

Revised 9/06